Introduction

Myofascial Trigger Point (MTrP) is a hyperirritable nodule associated with local twitch response and tenderness as well as referred pain upon manual examination.

Oxygen consumption increases linearly with increasing work rate in order to produce more ATP. Hemoglobin (Hb) and Myoglobin (Mb) are globular proteins that bind and deliver oxygen to the muscle. Hb has sigmoidal and Mb has hyperbolic oxygen binding curves (Figure 2).

Dry needling is used to reduce pain in patients with chronic neck pain who have MTrPs, but the exact mechanism that correlates dry needling to reduction of pain in these patients is unknown.

Methods

The inclusion criteria included patients with MTrPs in their upper trapezius muscle with chronic neck pain or shoulder girdle pain.

StO2 kinetics of Hb and Mb of upper trapezius muscle of fifteen patients (six males and nine females, with the average age of 34.94 ± 10.35) was measured following exercise using a near-infrared spectroscopy system (ISS OxiplexTS, Champaign, IL) before and after dry needling.

Subjects were scanned with NIRP sensor on their upper trapezius muscle, while sitting comfortably upright for 30 seconds, then holding a weight for a 20 seconds, and during oxygen recovery period for 30 seconds.

The exponential function $e^{-\frac{t}{\tau_1}} - e^{-\frac{t}{\tau_2}}$ was used to fit the data during recovery. $\tau_1$ is called the clearance time constant. It could be interpreted as inversely proportional to the rate at which oxygen is being removed from the muscle. The second time constant $\tau_2$ is the recovery time constant. It could be interpreted as inversely proportional to the blood flow.

A paired t-test and a correlation was performed to compare the: Initial Saturation, Decay time constant during exercise, Final Saturation, Recovery time constant and Clearance time constant during recovery before and after dry needling treatment.

Discussion

For sufficient recovery from oxygen depletion in muscle after exercise, both blood follow and oxygen extraction from blood by muscle are necessary. In this study, the recovery time constant corresponded to the blood supply rate and the clearance time constant corresponded to the oxygen extraction rate. The high correlation value between the clearance time constant of Visit 1 and Visit 3 shows reproducibility, which confirms the similarity of a certain measurement at Visit 1 to the corresponding measurement at Visit 3. According to T test there was a statistically significant differences between the clearance time constants at Visit 1 and visit 3 (p=0.01847<0.05).

It is aimed to further interpret both the blood supply and oxygen extraction rates’ correlation between visit 1 and visit 3 in future studies.

Conclusions

There was a high correlation and statistically significant difference between the oxygen extraction rate, clearance time constant from blood by muscle, after exercise.

Results

<table>
<thead>
<tr>
<th></th>
<th>Initial Saturation</th>
<th>Decay time constant during exercise</th>
<th>Final Saturation</th>
<th>Recovery time constant</th>
<th>Clearance time constant during recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlations between V1 and V3</td>
<td>0.81617</td>
<td>0.14210</td>
<td>0.79365</td>
<td>-0.09312</td>
<td>0.71771</td>
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<tr>
<td>T-Tests between V1 and V3</td>
<td>0.96846</td>
<td>0.49043</td>
<td>0.77625</td>
<td>0.71211</td>
<td>0.01847</td>
</tr>
</tbody>
</table>

References